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 Full text available: [pdf\(966.08 KB\)](#)

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We combine well-known techniques from the areas of error-correcting codes and cryptography to achieve a new type of cryptographic primitive that we refer to as a fuzzy commitment scheme. Like a conventional cryptographic commitment scheme, our fuzzy commitment scheme is both concealing and binding: it is infeasible for an attacker to learn the committed value, and also for the committer to decommit a value in more than one way. In a convent ...

2 [Architecture for Protecting Critical Secrets in Microprocessors](#)



Ruby B. Lee, Peter C. S. Kwan, John P. McGregor, Jeffrey Dwoskin, Zhenghong Wang

 May 2005 **ACM SIGARCH Computer Architecture News , Proceedings of the 32nd annual international symposium on Computer Architecture ISCA '05**, Volume 33 Issue 2

Publisher: IEEE Computer Society, ACM Press

 Full text available: [pdf\(143.62 KB\)](#)

 Additional Information: [full citation](#), [abstract](#), [cited by](#), [index terms](#)

We propose "secret-protected (SP)" architecture to enable secure and convenient protection of critical secrets for a given user in an on-line environment. Keys are examples of critical secrets, and key protection and management is a fundamental problem & often assumed but not solved & underlying the use of cryptographic protection of sensitive files, messages, data and programs. SP-processors contain a minimalist set of architectural features that can be built into a general-purpose microprocess ...

3 [SecCMP: a secure chip-multiprocessor architecture](#)



Li Yang, Lu Peng

 October 2006 **Proceedings of the 1st workshop on Architectural and system support for improving software dependability ASID '06**

Publisher: ACM Press

 Full text available: [pdf\(419.78 KB\)](#)

 Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Security has been considered as an important issue in processor design. Most of the existing mechanisms address security and integrity issues caused by untrusted main

memory in single-core systems. In this paper, we propose a secure Chip-Multiprocessor architecture (*SecCMP*) to handle security related problems such as key protection and core authentication in multi-core systems. Threshold secret sharing scheme is employed to protect critical keys because secret sharing is a distributed sec ...

Keywords: chip-multiprocessor, encryption, fault-tolerance, security

4 Secure systems: Energy and execution time analysis of a software-based trusted platform module



Najwa Aaraj, Anand Raghunathan, Srivaths Ravi, Niraj K. Jha

April 2007 **Proceedings of the conference on Design, automation and test in Europe DATE '07**

Publisher: ACM Press

Full text available: [pdf\(838.82 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

Trusted platforms have been proposed as a promising approach to enhance the security of general-purpose computing systems. However, for many resource-constrained embedded systems, the size and cost overheads of a separate Trusted Platform Module (TPM) chip are not acceptable. One alternative is to use a software-based TPM (SW-TPM), which implements TPM functions using software that executes in a protected execution domain on the embedded processor itself. However, since many embedded systems ...

5 Security as a new dimension in embedded system design: Security as a new dimension in embedded system design



Srivaths Ravi, Paul Kocher, Ruby Lee, Gary McGraw, Anand Raghunathan

June 2004 **Proceedings of the 41st annual conference on Design automation DAC '04**

Publisher: ACM Press

Full text available: [pdf\(209.10 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The growing number of instances of breaches in information security in the last few years has created a compelling case for efforts towards secure electronic systems. Embedded systems, which will be ubiquitously used to capture, store, manipulate, and access data of a sensitive nature, pose several unique and interesting security challenges. Security has been the subject of intensive research in the areas of cryptography, computing, and networking. However, despite these efforts, *security is ...*

Keywords: PDAs, architectures, battery life, cryptography, design, design methodologies, digital rights management, embedded systems, performance, security, security processing, security protocols, sensors, software attacks, tamper resistance, trusted computing, viruses

6 Authentication and authorization: Silicon physical random functions



Blaise Gassend, Dwaine Clarke, Marten van Dijk, Srinivas Devadas

November 2002 **Proceedings of the 9th ACM conference on Computer and communications security CCS '02**

Publisher: ACM Press

Full text available: [pdf\(433.69 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We introduce the notion of a Physical Random Function (PUF). We argue that a complex integrated circuit can be viewed as a silicon PUF and describe a technique to identify and authenticate individual integrated circuits (ICs). We describe several possible circuit realizations of different PUFs. These circuits have been implemented in commodity Field Programmable Gate Arrays (FPGAs). We present experiments which indicate that reliable

authentication of individual FPGAs can be performed even in the ...


Keywords: identification, physical random function, physical security, smartcard, tamper resistance, unclonability

7 Architectures for cryptography and security applications: A side-channel leakage free coprocessor IC in 0.18 μ m CMOS for embedded AES-based cryptographic and biometric processing

K. Tiri, D. Hwang, A. Hodjat, B. Lai, S. Yang, P. Schaumont, I. Verbauwhede

June 2005 **Proceedings of the 42nd annual conference on Design automation DAC '05**

Publisher: ACM Press

Full text available:  [pdf\(2.92 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Security ICs are vulnerable to side-channel attacks (SCAs) that find the secret key by monitoring the power consumption and other information that is leaked by the switching behavior of digital CMOS gates. This paper describes a side-channel attack resistant coprocessor IC and its design techniques. The IC has been fabricated in 0.18 μ m CMOS. The coprocessor, which is used for embedded cryptographic and biometric processing, consists of four components: an Advanced Encryption Standard (AES) ...


Keywords: countermeasure, differential power analysis, encryption, security IC, side-channel attack, smart card

8 Authentication: Pass-thoughts: authenticating with our minds

Julie Thorpe, P. C. van Oorschot, Anil Somayaji

September 2005 **Proceedings of the 2005 workshop on New security paradigms NSPW '05**

Publisher: ACM Press

Full text available:  [pdf\(3.94 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#)

We present a novel idea for user authentication that we call *pass-thoughts*. Recent advances in Brain-Computer Interface (BCI) technology indicate that there is potential for a new type of human-computer interaction: a user transmitting thoughts directly to a computer. The goal of a pass-thought system would be to extract as much entropy as possible from a user's brain signals upon "transmitting" a thought. Provided that these brain signals can be recorded and processed in an accurate and ...


Keywords: authentication, passwords

9 Security in embedded systems: Design challenges

Srivaths Ravi, Anand Raghunathan, Paul Kocher, Sunil Hattangady

August 2004 **ACM Transactions on Embedded Computing Systems (TECS)**, Volume 3 Issue 3

Publisher: ACM Press

Full text available:  [pdf\(3.67 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

Many modern electronic systems---including personal computers, PDAs, cell phones, network routers, smart cards, and networked sensors to name a few---need to access, store, manipulate, or communicate sensitive information, making security a serious concern in their design. Embedded systems, which account for a wide range of products from the electronics, semiconductor, telecommunications, and networking industries, face some of the most demanding security concerns---on the one hand, they are oft ...

Keywords: Embedded systems, architecture, authentication, battery life, cryptographic algorithms, decryption, encryption, hardware design, processing requirements, security, security attacks, security protocols, tamper resistance

10 On-line e-wallet system with decentralized credential keepers

Stig Frode Mjøl̂snes, Chunming Rong

February 2003 **Mobile Networks and Applications**, Volume 8 Issue 1

Publisher: Kluwer Academic Publishers

Full text available:  [pdf\(240.23 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We propose a generalization of the architecture of an electronic wallet, as first developed in the seminal European research project CAFE. With this model you can leave most of the content of your electronic wallet at the security of your residential electronic keeper, while roaming with your favorite mobile terminals. Emerging mobile handsets with both short range Bluetooth and cellular GPRS communications provide a sufficient communication platform for this electronic wallet architecture. Howe ...

Keywords: digital credentials, e-wallet architecture, mobile commerce, payment protocols, privacy

11 Oral II: Secure smartcardbased fingerprint authentication



T. Charles Clancy, Negar Kiyavash, Dennis J. Lin

November 2003 **Proceedings of the 2003 ACM SIGMM workshop on Biometrics methods and applications WBMA '03**

Publisher: ACM Press

Full text available:  [pdf\(452.50 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

In this paper, the fundamental insecurities hampering a scalable, wide-spread deployment of biometric authentication are examined, and a cryptosystem capable of using fingerprint data as its key is presented. For our application, we focus on situations where a private key stored on a smartcard is used for authentication in a networked environment, and we assume an attacker can launch o -line attacks against a stolen card. Juels and Sudan's *fuzzy vault* is used as a starting point for buildi ...

Keywords: authentication, biometrics, fingerprint, smartcard

12 Database sharing and privacy: GhostDB: querying visible and hidden data without leaks



Nicolas Ancaux, Mehdi Benzine, Luc Bouganim, Philippe Pucheral, Dennis Shasha

June 2007 **Proceedings of the 2007 ACM SIGMOD international conference on Management of data SIGMOD '07**

Publisher: ACM Press

Full text available:  [pdf\(416.88 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Imagine that you have been entrusted with private data, such as corporate product information, sensitive government information, or symptom and treatment information about hospital patients. You may want to issue queries whose result will combine private and public data, but private data must not be revealed. GhostDB is an architecture and system to achieve this. You carry private data in a smart USB key (a large Flash persistent store combined with a tamper and snoop-resistant CPU and small ...

Keywords: privacy, secure device, storage model

13 Invited Talks: Secure information sharing enabled by Trusted Computing and PEI models



Ravi Sandhu, Kumar Ranganathan, Xinwen Zhang

March 2006 **Proceedings of the 2006 ACM Symposium on Information, computer and communications security ASIACCS '06**

Publisher: ACM Press

Full text available: [pdf\(210.37 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The central goal of secure information sharing is to "share but protect" where the motivation to "protect" is to safeguard the sensitive content from unauthorized disclosure (in contrast to protecting the content to avoid loss of revenue as in retail Digital Rights Management). This elusive goal has been a major driver for information security for over three decades. Recently, the need for secure information sharing has dramatically increased with the explosion of the Internet and the convergenc ...

Keywords: PEI models, access control, authorization, secure information sharing, security framework, trusted computing



14 BITS: a smartcard protected operating system



Paul C. Clark, Lance J. Hoffman

November 1994 **Communications of the ACM**, Volume 37 Issue 11

Publisher: ACM Press

Full text available: [pdf\(3.80 MB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)



15 Authentication/protocols: A secure biometric authentication scheme based on robust hashing



Yagiz Sutcu, Husrev Taha Sencar, Nasir Memon

August 2005 **Proceedings of the 7th workshop on Multimedia and security MM&Sec '05**

Publisher: ACM Press

Full text available: [pdf\(821.83 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper, we propose a secure biometric based authentication scheme which fundamentally relies on the use of a robust hash function. The robust hash function is a one-way transformation tailored specifically for each user based on their biometrics. The function is designed as a sum of properly weighted and shifted Gaussian functions to ensure the security and privacy of biometric data. We discuss various design issues such as scalability, collision-freeness and security. We also provide tes ...

Keywords: authentication, biometrics, privacy, robust hashing, security



16 Embedded hardware design case studies: Design flow for HW / SW acceleration transparency in the thumbpod secure embedded system



David Hwang, Bo-Cheng Lai, Patrick Schaumont, Kazuo Sakiyama, Yi Fan, Shenglin Yang, Alireza Hodjat, Ingrid Verbauwhede

June 2003 **Proceedings of the 40th conference on Design automation DAC '03**

Publisher: ACM Press

Full text available: [pdf\(250.69 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper describes a case study and design flow of a secure embedded system called



ThumbPod, which uses cryptographic and biometric signal processing acceleration. It presents the concept of HW/SW acceleration transparency, a systematic method to accelerate Java functions in both software and hardware. An example of acceleration transparency for a Rijndael encryption function is presented. The embedded prototype hardware platform is also described. Acceleration transparency yields software and ...

17 Identification control: Owner-controlled information



Carrie Gates, Jacob Slonim

August 2003 **Proceedings of the 2003 workshop on New security paradigms NSPW '03**

Publisher: ACM Press

Full text available: [pdf\(1.06 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

Information about individuals is currently maintained in many thousands of databases, with much of that information, such as name and address, replicated across multiple databases. However, this proliferation of personal information raises issues of privacy for the individual, as well as maintenance issues in terms of the accuracy of the information. Ideally, each individual would own, maintain and control his personal information, allowing access to those who needed at the time it was needed. O ...

Keywords: architecture, privacy, security

18 An interactive codesign environment for domain-specific coprocessors



Patrick Schaumont, Doris Ching, Ingrid Verbauwhede

January 2006 **ACM Transactions on Design Automation of Electronic Systems (TODAES)**, Volume 11 Issue 1

Publisher: ACM Press

Full text available: [pdf\(406.61 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citings](#), [index terms](#)

Energy-efficient embedded systems rely on domain-specific coprocessors for dedicated tasks such as baseband processing, video coding, or encryption. We present a language and design environment called GEZEL that can be used for the design, verification and implementation of such coprocessor-based systems. The GEZEL environment creates a platform simulator by combining a hardware simulation kernel with one or more instruction-set simulators. The hardware part of the platform is programmed in GEZEL ...

Keywords: Cosimulation, hardware description language, hardware-software codesign

19 Ubiquitous computing (UC): Extending the EPC network: the potential of RFID in anti-counterfeiting



Thorsten Staaake, Frédéric Thiesse, Elgar Fleisch

March 2005 **Proceedings of the 2005 ACM symposium on Applied computing SAC '05**

Publisher: ACM Press

Full text available: [pdf\(106.51 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citings](#), [index terms](#)

The International Chamber of Commerce estimates that seven percent of the world trade is in counterfeit goods, with the counterfeit market being worth 500 billion USD in 2004. Many companies already use overt anti-counterfeiting measures like holograms to confine counterfeiting and product piracy. However, current techniques are not suited for automated tests of product authenticity as required in warehouses, or do not provide the required level of security. In this context, Radio Frequency Iden ...

Keywords: RFID, authentication, counterfeiting, track & trace

20 Computer forensics (CF): The advent of trusted computing: implications for digital forensics



Mike Burmester, Judie Mulholland

April 2006 **Proceedings of the 2006 ACM symposium on Applied computing SAC '06**

Publisher: ACM Press

Full text available:  [pdf\(137.02 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The release of computer hardware devices based on "trusted computing" technologies is heralding a paradigm shift that will have profound implications for digital forensics. In this paper, we map out the contours of a trusted environment in order to establish the context for the paper. This is followed by the main components of the TC architecture with an emphasis on the Trusted Platform and the Trusted Platform Module (TPM). The next section presents a synopsis based on three threat models, v ...

Keywords: *cybercrime, data recovery, encryption, file systems, forensics, specifications, trusted computing*

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